LAND LEVELING

Introduction

Leveling rice fields improves water use efficiency, increases grain yield and improves grain quality.

Leveling land improves water coverage which:

- reduces the amount of water required for land preparation
- improves crop establishment
- decreases the time to complete tasks
- results in better crop stands
- reduces weed problems and
- results in uniform crop maturity

Research Findings

Crop Yield

- Results of land-leveling experiments conducted in rainfed fields in Cambodia found the average increase in crop yield was 24% or 530 kilograms per hectare.
- A strong correlation was found between the levelness of the land and crop yield. For every 10 mm in surface variation there was a yield loss of 260 kg of grain.

Weed Control

- Improved water coverage from land leveling reduced weeds by up to 40%.
- Less time was needed for crop weeding. A reduction from 21 to 5 labor-days/ha was achieved.

Farm Operation

Land leveling facilitated the use of larger fields.

- Increasing field sizes from 0.1 hectare to 0.5 hectare increases the farming area by between 5% and 7%.
- Reshaping fields can reduce operating times by 10% to 15%.

Seeding Practices

Leveling reduces planting time by improving the reliability of direct seeding.

- Reduction in labor by 30 person days when direct seeding.

Efficiency of water use

The average difference in fields - highest to lowest portions of rice fields in Asia was 160 mm. This means:

- An extra 80 mm to 100 mm of water had to be stored in the field to give complete water coverage.
- Water in the higher fields was able to be used in the lower fields for land preparation, plant establishment and irrigation.

Other benefits and opportunities

- Plow the field on time.
- Harvest evenly ripened crop and
- Shed floodwaters more rapidly.

Systems of land leveling

Different systems require different field conditions and operating time to complete the task.

1. Draft animals and 2-wheel tractors using harrows and leveling boards.

- These leveling techniques require total water coverage of the field and require 7 to 8 days for a 2-wheeled tractor and 12 days per hectare of land using draft animals.

2. Four-wheel tractor using rear mounted tractor blades or drag buckets.

- Wet fields use a rear-mounted tractor blade.
- Dry fields use hydraulically operated drag buckets.

Work rates were dependent on the tractor size and the amount of soil to be moved. It will take approximately 8 hours to level 1 hectare with a rear mounted tractor blade. This reduces to about 4 hours when using a drag bucket.

3. Four-wheel tractor with a laser controlled bucket.

- The use of laser controlled equipment results in a much more level field. Accuracy was improved 50% when compared to other techniques.

Cost of land leveling

The costs vary according to the topography, the shape of the field and the equipment used.

	Animal Leveling board	2-wheel tractor harrows	4-wheel tractor blade
Purchase price ($)	500	1000	12,000
Time (days)	12	7	0.5
	Operating cost $/ha		
Labor	15.00	9.00	2.50
Fuel &oil		22.00	32.50
Repairs		5.00	7.50
Pumping costs	6.00	6.00	
	Fixed Cost $/ha		
Depreciation cost	12.00	4.00	7.50
Total Cost ($/ha)	**33.00**	**46.00**	**50.00**

- Cost ranges from $3 to $5 per 10 mm of soil moved per hectare.
- The application of additional fertilizer, especially phosphate, is necessary in areas from which soil is moved.
- Re-leveling the whole field should not be necessary for at least eight to ten years. Little variation in surface topography after two crops.

Financial benefits of land leveling

A cash flow analysis over a period of years shows that financial benefits do result from land leveling.

Year	1	2	3	4	5	6	7	8
	Additional Cost ($/ha)							
Leveling	50	0	0	0	0	0	0	0
Plowing	15	0	0	0	0	0	0	0
Fertilizer	13	6	0	0	0	0	0	0
	Financial Benefit ($/ha)							
Grain yield	53	53	53	53	53	53	53	53
Reduction in weeding	8	8	8	8	8	8	8	8
Cumulative cash flow	-17	38	99	160	221	282	343	404

- The costs allow for an extra plowing and extra fertilizer in the first and second years. The benefits include reduced weeding costs of 40%.

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